

CHAPTER 5. RED OBSTRUCTION LIGHT SYSTEM

50. PURPOSE

Red Obstruction lights are used to increase conspicuity during nighttime. Daytime and twilight marking is required. Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

51. STANDARDS

The red obstruction lighting system is composed of flashing omnidirectional beacons (L-864) and/or steady burning (L-810) lights. When one or more levels is comprised of flashing beacon lighting, the lights should flash simultaneously.

a. Single Obstruction Light. A single (L-810) light may be used when more than one obstruction light is required either vertically or horizontally or where maintenance can be accomplished within a reasonable time.

1. Top Level. A single light may be used to identify low structures such as airport ILS buildings and long horizontal structures such as perimeter fences and building roof outlines.

2. Intermediate Level. Single lights may be used on skeletal and solid structures when more than one level of lights is installed and there are two or more single lights per level.

b. Double Obstruction Light. A double (L-810) light should be installed when used as a top light, at each end of a row of single obstruction lights, and in areas or locations where the failure of a single unit could cause an obstruction to be totally unlighted.

1. Top Level. Structures 150 feet (46m) AGL or less should have one or more double lights installed at the highest point and operating simultaneously.

2. Intermediate Level. Double lights should be installed at intermediate levels when a malfunction of a single light could create an unsafe condition and in remote areas where maintenance cannot be performed within a reasonable time. Both units may operate simultaneously, or a transfer relay may be used to switch to a spare unit should the active system fail.

3. Lowest Level. The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by an FAA aeronautical study, the lowest level of lights may be eliminated.

52. CONTROL DEVICE

Red obstruction lights should be operated by a satisfactory control device (e.g., photo cell, timer, etc.) adjusted so the lights will be turned on when the northern sky illuminance reaching a vertical surface falls below a level of 60 foot-candles (645.8 lux) but before reaching a level of 35 foot-candles (367.7 lux). The control device should turn the lights off when the northern sky illuminance rises to a level of not more than 60 foot-candles (645.8 lux). The lights may also remain on continuously. The sensing device should, if practical, face the northern sky in the Northern Hemisphere. (See AC 150/5345-43.)

53. POLES, TOWERS, AND SIMILAR SKELETAL STRUCTURES

The following standards apply to radio and television towers, supporting structures for overhead transmission lines, and similar structures.

a. Top Mounted Obstruction Light.

1. Structures 150 Feet (46m) AGL or Less. Two or more steady burning (L-810) lights should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.

2. Structures Exceeding 150 Feet (46m) AGL. At least one red flashing (L-864) beacon should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.

3. Appurtenances 40 Feet (12m) or Less. If a rod, antenna, or other appurtenance 40 feet (12m) or less in height is incapable of supporting a red flashing beacon, then it may be placed at the base of the appurtenance. If the mounting location does not allow unobstructed viewing of the beacon by a pilot, then additional beacons should be added.

4. Appurtenances Exceeding 40 Feet (12m). If a rod, antenna, or other appurtenance exceeding 40 feet (12m) in height is incapable of supporting a red flashing beacon, a supporting mast with one or more beacons should be installed adjacent to the appurtenance. Adjacent installations should not exceed the height of the appurtenance and be within 40 feet (12m) of the tip to allow the pilot an unobstructed view of at least one beacon.

b. Mounting Intermediate Levels. The number of light levels is determined by the height of the structure, including all appurtenances, and is detailed in Appendix 1. The number of lights on each level is

determined by the shape and height of the structure. These lights should be mounted so as to ensure an unobstructed view of at least one light by a pilot.

1. Steady Burning Lights (L-810).

(a) Structures 350 Feet (107m) AGL or Less.

Two or more steady burning (L-810) lights should be installed on diagonally or diametrically opposite positions.

(b) Structures Exceeding 350 Feet (107m) AGL. Install steady burning (L-810) lights on each outside corner of each level.

2. Flashing Beacons (L-864).

(a) Structures 350 Feet (107m) AGL or Less.

These structures do not require flashing (L-864) beacons at intermediate levels.

(b) Structure Exceeding 350 Feet (107m) AGL.

At intermediate levels, two beacons (L-864) should be mounted outside at diagonally opposite positions of intermediate levels.

54. CHIMNEYS, FLARE STACKS, AND SIMILAR SOLID STRUCTURES

a. Number of Light Units.

1. The number of units recommended depends on the diameter of the structure at the top. The number of lights recommended below are the minimum.

2. When the structure diameter is:

(a) 20 Feet (6m) or Less. Three light units per level.

(b) Exceeding 20 Feet (6m) But Not More Than 100 Feet (31m). Four light units per level.

(c) Exceeding 100 Feet (31m) But Not More Than 200 Feet (61m). Six light units per level.

(d) Exceeding 200 Feet (61m). Eight light units per level.

b. Top Mounted Obstruction Lights.

1. **Structures 150 Feet (46m) AGL or Less.** L-810 lights should be installed horizontally at regular intervals at or near the top.

2. **Structures Exceeding 150 Feet (46m) AGL.** At least three L-864 beacons should be installed.

3. **Chimneys, Cooling Towers, and Flare Stacks.** Lights may be displayed as low as 20 feet (6m) below the top to avoid the obscuring effect of deposits and heat generally emitted by this type of structure. It is important that these lights be readily accessible for cleaning and lamp replacement. It is understood that

with flare stacks, as well as any other structures associated with the petrol-chemical industry, normal lighting requirements may not be necessary. This could be due to the location of the flare stack/structure within a large well-lighted petrol-chemical plant or the fact that the flare, or working lights surrounding the flare stack/structure, is as conspicuous as obstruction lights.

c. Mounting Intermediate Levels. The number of light levels is determined by the height of the structure including all appurtenances. For cooling towers 600 feet (183m) or less, intermediate light levels are not necessary. Structures exceeding 600 feet (183m) AGL should have a second level of light units installed approximately at the midpoint of the structure and in a vertical line with the top level of lights.

1. **Steady Burning (L-810) Lights.** The recommended number of light levels may be obtained from Appendix 1. At least three lights should be installed on each level.

2. **Flashing (L-864) Beacons.** The recommended number of beacon levels may be obtained from Appendix 1. At least three lights should be installed on each level.

(a) Structures 350 Feet (107m) AGL or Less. These structures do not need intermediate levels of flashing beacons.

(b) Structures Exceeding 350 Feet (107m) AGL. At least three flashing (L-864) beacons should be installed on each level in a manner to allow an unobstructed view of at least one beacon.

55. WIND TURBINE STRUCTURES

Wind turbine structures should be lighted by mounting two flashing red beacons (L-864) on top of the generator housing. Both beacons should flash simultaneously. Lighting fixtures are to be mounted at a horizontal separation to ensure an unobstructed view of at least one fixture by a pilot approaching from **any** direction.

56. GROUP OF OBSTRUCTIONS

When individual objects, except wind turbines, within a group of obstructions are not the same height and are spaced a maximum of 150 feet (46m) apart, the prominent objects within the group should be lighted in accordance with the standards for individual obstructions of a corresponding height. If the outer structure is shorter than the prominent, the outer structure should be lighted in accordance with the standards for individual obstructions of a

corresponding height. Light units should be placed to ensure that the light is visible to a pilot approaching from **any** direction. In addition, at least one flashing beacon should be installed at the top of a prominent center obstruction or on a special tower located near the center of the group.

57. ALTERNATE METHOD OF DISPLAYING OBSTRUCTION LIGHTS

When recommended in an FAA aeronautical study, lights may be placed on poles equal to the height of the obstruction and installed on or adjacent to the structure instead of installing lights on the obstruction.

58. PROMINENT BUILDINGS, BRIDGES, AND SIMILAR EXTENSIVE OBSTRUCTIONS

When objects within a group of obstructions are approximately the same overall height above the surface and are located a maximum of 150 feet (46m) apart, the group of obstructions may be considered an extensive obstruction. Install light units on the same horizontal plane at the highest portion or edge of prominent obstructions. Light units should be placed to ensure that the light is visible to a pilot approaching from **any** direction. If the structure is a bridge and is over navigable water, the sponsor must obtain prior approval of the lighting installation from the Commander of the District Office of the United States Coast Guard to avoid interference with marine navigation. Steady burning lights should be displayed to indicate the extent of the obstruction as follows:

a. Structures 150 Feet (46m) or Less in Any Horizontal Direction. If the structure/bridge/extensive obstruction is 150 feet (46m) or less horizontally, at least one steady burning light (L-810) should be displayed on the highest point at each end of the major axis of the obstruction. If this is impractical because of the overall shape, display a double obstruction light in the center of the highest point.

b. Structures Exceeding 150 Feet (46m) in at Least One Horizontal Direction. If the structure/bridge/extensive obstruction exceeds 150 feet (46m) horizontally, display at least one steady burning light for each 150 feet (46m), or fraction thereof, of the overall length of the major axis. At least one of these lights should be displayed on the highest point at each end of the obstruction. Additional lights should be displayed at approximately equal intervals not to exceed 150 feet (46m) on the highest points along the edge between the end lights. If an obstruction is located near a landing area and two or more edges are the same height, the edge nearest the landing area should be lighted.

c. Structures Exceeding 150 Feet (46m) AGL. Steady burning red obstruction lights should be installed on the highest point at each end. At intermediate levels, steady burning red lights should be displayed for each 150 feet (46m) or fraction thereof. The vertical position of these lights should be equidistant between the top lights and the ground level as the shape and type of obstruction will permit. One such light should be displayed at each outside corner on each level with the remaining lights evenly spaced between the corner lights.

d. Exceptions. Flashing red beacons (L-864) may be used instead of steady burning obstruction lights if early or special warning is necessary. These beacons should be displayed on the highest points of an extensive obstruction at intervals not exceeding 3,000 feet (915m). At least three beacons should be displayed on one side of the extensive obstruction to indicate a line of lights.

e. Ice Shields. Where icing is likely to occur, metal grates or similar protective ice shields should be installed directly over each light unit to prevent falling ice or accumulations from damaging the light units. The light should be mounted in a manner to ensure an unobstructed view of at least one light by a pilot approaching from any direction.